Workshop Report: Rural Electric Cooperative Distributed Energy Resource Business Model Development Workshops

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1 National Renewable Energy Laboratory
2 Mana Group Consulting
3 Pacific Northwest National Laboratory

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The first Rural Electric Cooperative Distributed Energy Resource Business Model Development Workshop was held July 11, 2024, at Tri-State Generation and Transmission Association Inc. headquarters in Westminster, Colorado. The second workshop, hosted by Pacific Northwest Generating Cooperative, was held on Oct. 9, 2024, in Portland, Oregon during their annual meeting.

This work was completed as part of the Rural and Agricultural Income and Savings from Renewable Energy (RAISE) Initiative, a joint initiative between the U.S. Department of Energy and the U.S. Department of Agriculture.

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1 Introduction

The United States' energy future is being shaped by decades of technology innovation, rapidly changing consumer requirements, and governmental focus on securing reliable, low-cost energy sources. With expanded electrification and increased emphasis on grid reliability coupled with the heightened complexity and risks associated with transmission infrastructure, the use of distributed energy resources (DERs) is more commonly being considered a safe, efficient, and cost-effective way to maintain grid resilience and reliability. Amidst improvements in performance, decreasing costs, and unprecedented federal policy support for DERs, electric cooperatives are considering new opportunities to use these assets to ensure secure and reliable operations for millions of customers.

The Inflation Reduction Act increased several key tax incentives for DERs, introduced direct pay for tax-exempt entities to build qualifying clean energy projects, and expanded tax credit eligibility to include stand-alone energy storage, microgrid controllers, and interconnection upgrades. The Bipartisan Infrastructure Law provides $5 billion for Tribal nations, local governments, states, and state regulators to demonstrate cutting-edge approaches to distribution, storage, and transmission infrastructure to strengthen grid operations.

These policies, coupled with new collaboration between the U.S. Department of Energy (DOE) and U.S. Department of Agriculture (USDA) to catalyze the development and implementation of novel DER business models present an unparalleled opportunity for the expansion of DERs across the electric cooperative system. Because generation and transmission cooperatives (G&Ts)[1] represent a key development pathway for larger-scale distributed generation across the country, they are uniquely positioned to lead this transformation.

In light of these developments, a series of workshops were developed to collaborate on the development of business models for DERs in rural electric cooperative ecosystems. The first workshop was held July 11, 2024, at the Tri-State Generation and Transmission Association Inc. headquarters in Westminster, Colorado (hereafter referred to as the "Tri-State Workshop"). The second workshop was hosted by Pacific Northwest Generating Cooperative (PNGC Power) on Oct. 9, 2024, in Portland, Oregon (hereafter referred to as the "PNGC Power Workshop"). These workshops convened representatives from G&Ts, distribution cooperatives,[2] the energy industry, the financial community, the U.S. government, national and regional organizations, and national laboratories to share perspectives on the unique needs, challenges, and opportunities that they face as DERs are further integrated into the grid. The workshops were designed to address the following objectives: (1) develop the enabling attributes of electric cooperative DER business models, (2) explore pathways for generating community benefits from these assets, and (3)

[1]Generation and transmission cooperatives (G&Ts) are responsible for the purchase, generation, and transportation of electric power provided to most of the nation's electricity distribution cooperatives. Typically made up of the distribution cooperatives that they provide power to, G&Ts were formed to allow these distribution cooperatives to obtain power at a lower cost than they would have been able to achieve individually. G&Ts may own generation or transmission assets or may obtain or move power through agreements with other companies.

[2] Distribution cooperatives are typically member-owned organizations that provide electricity and other services to member consumers.

identify technical challenges and market risks for DERs in rural electric cooperative service territories.

This report outlines key findings and major themes identified by workshop participants that federal agencies, G&Ts, distribution cooperatives, and other entities can consider to advance electric cooperative DER business models.

2 Workshop Overview

The Tri-State Workshop convened 55 participants from the organizations listed in Table 1. The PNGC Power Workshop convened 43 participants from the organizations listed in Table 2. The complete agendas for each workshop are presented in the appendix. The workshops included keynote addresses, technical presentations, and stakeholder panels to allow participants to gain a broad understanding of the challenges and opportunities related to DER implementation. Interactive breakout sessions were conducted to facilitate discussion across sectors and identify cross-cutting solutions. Participants were asked to share individual experiences and provide feedback in the following topic areas: (1) development and implementation of new electric cooperative DER business models, (2) pathways for community engagement and benefits, (3) hybrid system design and operation in electric cooperative systems, and (4) federal and lab-based technical assistance and funding programs.

Table 1. Tri-State Workshop Participants

Participant Type	Participants
U.S. Government	U.S. Department of Energy Office of Clean Energy Demonstrations U.S. Department of Energy Wind Energy Technologies Office U.S. Department of Agriculture
National Laboratories	Idaho National Laboratory National Renewable Energy Laboratory Pacific Northwest National Laboratory
Rural Electric Utilities	Basin Electric Power Cooperative Central Electric Power Cooperative Chugach Electric Association East River Electric Power Cooperative Georgia Transmission Great River Energy Highline Electric Association Hoosier Energy La Plata Electric Association Minnkota Power Cooperative Mountain Parks Electric Mountain View Electric Association Oklahoma Electric Cooperative PNGC Power San Isabel Electric Association Sangre de Cristo Electric Association Tri-State Generation and Transmission Association Wheat Belt Public Power District
National Organizations	National Rural Electric Cooperative Association
Regional Organizations	CURE Minnesota Mana Group

Participant Type	Participants
	Rocky Mountain Institute
	Rocky Mountain Farmers Union
Wind Energy Industry	E2SG Partners
	Electric Power Research Institute
	EWT International
Financial Community	CoBank

Table 2. PNGC Power Workshop Participants

Participant Type	Participants
U.S. Government	U.S. Department of Energy Office of Clean Energy Demonstrations
	U.S. Department of Energy Wind Energy Technologies Office
	U.S. Department of Agriculture
National Laboratories	National Renewable Energy Laboratory
	Pacific Northwest National Laboratory
Rural Electric Utilities	Arizona Electric Power Cooperative
	Big Bend Electric Cooperative
	Central Electric Cooperative
	Consumers Power Inc.
	Coos-Curry Electric Cooperative
	Dairyland Power Cooperative
	Fall River Rural Electric Cooperative
	Hood River Electric and Internet Cooperative
	Idaho County Light and Power
	Inland Power
	Missoula Electric Cooperative
	Northern Lights, Inc.
	Northwest Requirements Utilities
	Orcas Power & Light Cooperative
	PNGC Power
	Raft River Electric
	Ravalli Electric Cooperative
	Tri-State Generation and Transmission Association
National Organizations	Farmers Conservation Alliance
Regional Organizations	Mana Group
	MCShovlin Communications
Wind Energy Industry	Bergey Windpower
	One Energy

3 Key Takeaways

This section lists key takeaways representing individual feedback from participants. The content presented here does not endorse any individual idea but rather reflects participant discussion.

- Cross-sector perspectives and collaboration are key to implementing business models that make DERs accessible.
    - The design of business models that balance benefits for G&Ts, distribution cooperatives, rural ratepayers, and broader communities needs to be informed by these different parties' perspectives, needs, and challenges.
    - Historically, there has been limited interest, motivation, and opportunities for representatives of these sectors to meet and explore the topics addressed by these workshops.
    - Limited connections, lack of rapport, and narrow timelines for funding opportunities can minimize the extent to which cross-sector collaboration on this topic takes place.
- G&Ts, distribution cooperatives, ratepayers, and developers can consider strengthening collaboration to capitalize on technology advancements and explore new business models.
    - Many smaller distribution cooperatives lack the resources (i.e., staff time, expertise, and budget for consultants) to apply for and manage federal grants, access technical assistance opportunities, and write community benefit plans, resulting in challenges with accessing funding specifically designed to help them.
    - Community benefit plan requirements were developed to ensure that benefits to hosting communities are maximized, but there is significant uncertainty on how to create such plans and what should be included in them.
- G&Ts can play an important role in addressing the challenges faced by rural distribution cooperatives and communities more broadly by:
    - Implementing policies that provide greater flexibility for DER installations in their territories.
    - Partnering with their members to develop projects that provide cost of power equal to or less than their current source of wholesale power.
    - Aggregating distributed generation assets to optimize operation and maintenance.
    - Allowing for the adoption of flexible power contracts with distribution cooperatives, which have the potential to increase local power generation, lower costs, improve resilience, improve reliability, and provide community benefits.
- Technologies like distributed wind offer an alternative to DERs with larger land-use footprints; however, there is limited awareness and lack of demonstration of these opportunities.
    - The farming community is looking for solutions that are "both/and"—i.e., they want clean energy *and* they want to keep farmers farming.
    - Workshop presentations and participant discussions tended to focus on solar and agrivoltaics, with limited dialogue about alternative renewable energy options,

which have distinct operational characteristics and impacts on the farm and distribution network.

- To develop effective business models for DER expansion in rural electric cooperatives, it is crucial to consider the following factors:
    - Acquiring or building cost-effective DERs creates local value, which is integral for successful cooperative energy ecosystems.
    - Focusing on demand-side solutions,[3] such as providing incentives for end users to reduce their electricity consumption, involves acquiring or creating cost-effective energy resources, balancing supply and demand in real time, and ensuring that such programs are flexible, valuable, and easy to implement.
    - By capitalizing on economies of scale, cooperatives can reduce costs, standardize processes, and support distribution interconnection, engineering, procurement, construction, project management, and administrative tasks.
    - Alternative ownership models can finance local projects without up-front investments, targeting retail rate reductions and benefiting low- to moderate-income consumers, Tribes, public agencies, and nonprofits.
    - G&Ts are better equipped to leverage DERs in the market when they have increased visibility and control over DERs within their territories.

[3] Demand-side management refers to the ability of end users to manage their electricity use through reduction and other measures.

4 Discussion Items

In addition to the takeaways described earlier, this section lists key challenges and opportunities highlighted by workshop participants, organized by topic. These discussion items do not reflect the authors' perspectives or those of the workshop hosts, but rather those of the workshop attendees.

4.1 New Electric Cooperative DER Business Models

Challenges

- Participants generally expressed limited understanding of the attributes of DER technologies and how they fit into their operations and the wider electrical ecosystem, highlighting knowledge gaps regarding:
    - Understanding the full range of DER technologies and their attributes, including how to value distributed generation, how to aggregate DERs into virtual power plants, and when it makes sense to integrate them into wholesale markets.
    - How projects are conceived, screened, and originated, and how they would pay to get a project to the request-for-proposal stage.
    - The long-term operations and management of such projects.
    - How to develop policies that facilitate the development and implementation of new DER business models.
    - Lack of standardization when it comes to how G&Ts have visibility and control of DERs.
- Contractual agreements between G&Ts and distribution cooperatives were highlighted as a challenge to the development of DER business models.
    - G&Ts may lack a contractual mechanism for aggregating services and/or monetizing value streams from DER projects, such as selling into an independent system operator market.
    - Participants expressed concern over shifting policy or contractual landscapes that might negatively impact project economics over time.
- Many cooperatives cited limited understanding of how to leverage tax credits and federal funding.
- Lack of bridge financing[4] options were highlighted as restricting flexibility for cooperatives to develop novel approaches to invest in DERs.
- No standardized approaches to cybersecurity across cooperatives was discussed as a key barrier.
- Many cooperatives expressed the need for more case studies and examples of successful projects that include different development approaches, ownership types, and technology choices.

[4] Bridge financing is a temporary funding option that provides interim funds until a long-term financing option is secured.

Opportunities

- Some G&Ts are implementing innovative strategies by creating unique subscription ownership models that allow their member systems to finance and own local projects while selling savings-based subscriptions to their end-use members.
    - These kinds of strategies can help spur local economic growth and promote local ownership of assets.
    - Alternative ownership models can finance local projects without up-front investments, targeting retail rate reductions and benefiting low- to moderate-income consumers, Tribes, public agencies, and nonprofits.
- The introduction of direct pay through the Inflation Reduction Act was cited multiple times as playing a key role in providing participants with financial flexibility to innovate new business models.
- Participants frequently identified cost savings and improved resiliency as major drivers for both their members and their interest in developing projects.
- Participants consistently identified renewable energy attributes as a driver toward adoption (behind only cost and resilience).
- Participants highlighted the need for open, frequent communication as key to finding win-win solutions.
- Participants acknowledged the National Rural Electric Cooperative Association's role in developing templates and guidelines (examples include interconnection procedures and net metering policies), and they expressed hope that this model might extend to supporting new DER business models.

4.2 Pathways for Community Engagement and Benefits

Challenges

- Electric cooperatives expressed the need for more clarity on what is required in community benefit plans, citing changing requirements and complexity as significant barriers to developing projects with community benefit plans.
    - These concerns were widely shared despite the publicly available federal resources that list out requirements for such plans, hinting at potential challenges in the dissemination or content of these resources.
- Proactive outreach and engagement were described as necessary to gain community support for projects, but both G&Ts and distribution cooperatives cited limited time and capacity as barriers to accomplishing this engagement.
- Public pushback and misinformation remain primary challenges during the project development process for both distributed and utility-scale renewable energy projects, especially as projects are developed closer to population centers and the competition between energy and agriculture (principally solar) become more noticeable.
- Participants expressed a need for more successful demonstration projects to rebuild consumer trust in renewable energy.

Opportunities

- Communicating "both/and" energy options that retain agricultural productivity while providing revenue for farmers is key to navigating public sentiments around the loss of productive farmland.[5]
- Despite public pushback, many participants cited growing interest in clean energy projects in rural communities and highlighted community benefit plans as a crucial way to foster open dialogue and build support for these projects.

4.3 Hybrid System Design and Operation in Electric Cooperative Systems

Challenges

- Participants highlighted the challenges of designing standardized "plug-and-play" hybrid systems that can be implemented at scale while also addressing the unique, localized needs of end users.
- Cooperatives expressed hesitance when it comes to adopting artificial intelligence-based DER management systems, citing them as risky because there are few successful demonstrations.
- Determining storage capacity relative to generation in hybrid systems remains a challenge, which is compounded by the dearth of cost data and reference hybrid systems in modeling tools.
- Some participants relayed limited technical understanding of how hybrid systems operate and integrate with the grid.
- Participants expressed concern for how developers, partners, technology choices, and suppliers are chosen from a quality and compatibility perspective.

Opportunities

- Innovative uses of modeling tools and techniques have provided additional clarity on the optimization of hosting capacity and where it makes sense to position hybrid projects on distribution lines.
- Showcasing successful hybrid demonstration projects can provide tangible examples for cooperatives to follow as they build their grid assets.
- Participants relayed that demand reduction policies (through both generation and storage) are a strong motivator driving adoption of hybrid systems.

4.4 Federal and Lab-Based Technical Assistance and Funding Programs

Challenges

- Smaller distribution cooperatives often do not have the in-house budget, expertise, and staff time to find funding opportunities and write grant applications for DERs.
- Participants also expressed limited awareness of how to find and access technical assistance to complete grant applications.

[5] https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58268

- Some cooperatives, particularly smaller ones, do not apply for federal funding opportunities because the award amount does not justify the effort and time required to apply.
- Attendees who submitted grant applications that failed cited lengthy response times and limited feedback on suggested areas for improvement as a challenge.

Opportunities

- Significant increases in federal support through programs like Powering Affordable Clean Energy, Empowering Rural America (New ERA), and Rural Energy for America Program represent unprecedented opportunities for the expansion of distributed generation, especially in rural and underserved communities.
- Integrating efforts across cooperatives with limited resources (i.e., time, expertise, or staffing capacity), such as through a shared services grant coordinator, has been a successful strategy to help these entities apply for federal funding and technical assistance opportunities.
- Similarly, aggregating smaller projects across cooperatives was highlighted as a way to increase efficiency in the application, selection, and dispensation of federal funding.
- Introducing opportunities for bridge financing where possible as part of federal funding awards has the potential to increase the success of project implementation, particularly in low-income communities.

5 Conclusion

These workshops underscored the importance of cross-sector collaboration, effective communication, and leveraging existing resources and partnerships as critical to the development and implementation of successful DER business models in the electric cooperative ecosystem. These convenings laid the foundation for future conversations among key stakeholder groups to address shared challenges and opportunities as more DERs are connected to the grid.

Appendix. Workshop Agenda

Table A-1. Complete Agenda for the Tri-State Workshop

Thursday, July 11, 2024	
8:40 a.m.	**Welcome and Introduction** *Setting the Stage for Building the Electric Cooperative Ecosystem* Reg Rudolph, Chief Energy Innovation Officer, Tri-State
8:50 a.m.	**Supporting Development of Cooperative DER Business Models** Patrick Gilman, Program Manager, Wind Energy Technologies Office, DOE
9:00 a.m.	**Emerging Electric Cooperative DER Business Models** *Description:* Presentation of DER technology configurations under consideration, business model economics, community benefits, and challenges faced with implementation that federal programs could help to overcome. This session will also include opportunities for workshop participants to share relevant examples from their cooperative. Moderator: Bret Barker, Senior Advisor, Wind Energy Technologies Office, DOE - Reg Rudolph, Chief Energy Innovation Officer, Tri-State: *Co-Optima* - Nick Shumaker, Manager of System Engineering, Oklahoma Electric Cooperative: *Business Model for Home Energy Microgrids* - Jessica Matlock, Chief Executive Officer, PNGC Power*: Support Mechanisms for Distribution Members* - Allison Hamilton, Director of Markets and Rates, NRECA: *Member Resources and Success Stories*
10:30 a.m.	**Networking Break**
10:45 a.m.	**Pathways for Community Engagement and Benefits** *Description:* Presentation of community engagement and benefits from federal program and community organization perspectives. Identification of challenges, opportunities, priority benefits, and pathways and supports for achieving them. Moderator: Jennifer Jenkins, Chief Executive Officer, Mana Group - Aliza Drewes, Senior Advisor to the Rural Utilities Service, USDA: *Community Benefit Plan Priorities* - Toniqua Hay, Stakeholder Engagement Specialist, Office of Clean Energy Demonstrations, DOE: *Community Benefit Plan Priorities* - Maggie Schuppert, Campaigns Director, CURE Minnesota: *Energy Democracy* - LeeAnne Sanders, Director of Communications, Rocky Mountain Farmers Union: *Identifying the Needs of Small and Medium Farmers*

12:00 p.m.	**Networking Lunch** Provided by Tri-State
1:00 p.m.	**Alignment with DOE Priorities, Programs, and Initiatives** Eric Lantz, Director, Wind Energy Technologies Office, DOE
1:15 p.m.	**Interactive Activity: Focusing Our Work** *Description:* Participants will work individually and in small groups to coalesce around the top opportunities and challenges for DER business models in their areas. Facilitator: Suzanne MacDonald, Senior Researcher, National Renewable Energy Laboratory
1:45 p.m.	**Hybrid System Design and Operations** *Description:* Presentation of examples of model hybrid systems configurations, how they operate, and tools that can be used to optimize their design, performance, and operation. Identification of challenges and opportunities associated with hybrids. Moderator: Caity Clark, National Renewable Energy Laboratory - Dan Juhl, Partner, E2SG Partners: *Red Lake and Lakes Region Hybrids* - Brett Pingree, Country Manager for North America, EWT International: *Turnkey Hybrid Solutions* - Megan Culler, Power Engineer, Idaho National Laboratory: *Resilience Development for Electric Energy Delivery Systems (ResDEEDS)* - Jennifer King, Research Engineer, National Renewable Energy Laboratory: *Distributed System Modeling and Testing for Rural Communities* - Brandon Fitchett, Program Manager, Electric Power Research Institute: *Wind Intelligently Integrated into Rural Electric Systems (WIIRES)*
3:00 p.m.	**Networking Break**
3:15 p.m.	**Interactive Activity: Preparing for Success** *Description:* Through small group interactions, participants will work through different scenarios to identify the factors needed to design and deploy successful DER business models. Facilitator: Suzanne MacDonald, Senior Researcher, National Renewable Energy Laboratory
4:45 p.m.	**Closing and Next Steps** Reg Rudolph, Chief Energy Innovation Officer, Tri-State

Table A-2. Complete Agenda for the PNGC Power Workshop

Thursday, October 9, 2024	
8:30 a.m.	**Welcome and Introduction** *Setting the Stage for Innovation within the Electric Cooperative Ecosystem* Jessica Matlock, Chief Executive Officer, PNGC Power
8:40 a.m.	**USDA Perspective on Distributed Generation for Rural Electric Cooperatives** Aliza Drewes, Senior Advisor to the Rural Utility Service, U.S. Department of Agriculture
8:50 a.m.	**Enabling DER Business Models on Agricultural Land** *Description:* This session will include examples of federal programs which can be leveraged to demonstrate and deploy DER systems and business models in rural places and on agricultural lands. Panelists will explore pathways for community benefits and engagement. There will also be opportunities for workshop participants to share relevant examples from their cooperative. Moderator: Bret Barker, Senior Advisor, Wind Energy Technologies Office, DOE - Toniqua Hay, Stakeholder Engagement Specialist, Office of Clean Energy Demonstrations, DOE: *DOE Energy Improvements in Rural and Remote Areas Program* - Dennis Anderson, General Field Representative, Rural Utility Service, U.S. Department of Agriculture: *USDA Rural Development Energy Programs* - Keith Kueny, Energy & Resiliency Manager, Farmers Conservation Alliance: *Renewable Energy Innovation on Agricultural Land in the Pacific Northwest*
10:00 a.m.	**Networking Break**
10:20 a.m.	**Example DER Use Cases and Business Models** *Description:* Presentation of example projects and business models across a range of project sizes, interconnected to a rural distribution cooperative network. Moderator: Alice Orrell, Senior Advisor, Wind Energy Technologies Office, DOE - Mike Bergey, President & CEO, Bergey Windpower: *Networked Residential and Small Commercial Microgrids* - Heidi Tinnesand, EVP & Head of Project Planning, One Energy: *DERs for Large Commercial and Industrial Decarbonization* - Reg Rudolph, Chief Energy Innovation Officer, Tri-State: *Co-Optima Distributed Energy Resource Cooperative*
11:30 p.m.	**Interactive Activity 1: Visualizing DER Opportunities for Distribution Coops and Their Members**

	Description: Participants will work in small groups to conceive projects across a range of project sizes, interconnected to a rural distribution cooperative network. *Facilitators:* Ian Baring-Gould, National Renewable Energy Laboratory Nate Schmitt, Mana Group Consulting Charles Newcomb, Mana Group Consulting Sarah Barrows, Pacific Northwest National Laboratory
12:00 p.m.	**Networking Lunch**
1:00 p.m.	**Interactive Activity 2: Challenges to Realizing DER Opportunities** *Description:* Through small group interactions, participants will identify challenges to DER deployment and identify different strategies for overcoming those impediments. *Facilitators:* Ian Baring-Gould, National Renewable Energy Laboratory Nate Schmitt, Mana Group Consulting Charles Newcomb, Mana Group Consulting Sarah Barrows, Pacific Northwest National Laboratory
1:30 p.m.	**Networking Break**
1:50 p.m.	**Interactive Activity 3: Overcoming Challenges to DER Opportunities** *Description:* Participants will continue the strategy discussion while integrating how small to medium farms can streamline solutions to challenges/lessons learned from the previous panel. *Facilitators:* Ian Baring-Gould, National Renewable Energy Laboratory Nate Schmitt, Mana Group Consulting Charles Newcomb, Mana Group Consulting Sarah Barrows, Pacific Northwest National Laboratory Strategy Ranking Exercise and Report Out
2:30 p.m.	**Closing and Next Steps** Jessica Matlock, Chief Executive Officer, PNGC Power
2:40 p.m.	**Workshop Adjourns**

Tri-State = Tri-State Generation and Transmission Association; DER = distributed energy resource; DOE = U.S. Department of Energy; PNGC = Pacific Northwest Generating Cooperative; NRECA = National Rural Electric Cooperative Association; USDA = U.S. Department of Agriculture